CASE STUDY

Rimac Leverages Modelon Technology for Full Multi-Physics Vehicle System Simulations

RIMAC

HIGHLIGHTS:

- Rimac needed a more efficient and flexible way to evaluate multi-physics powertrain systems to reduce the need of making physical prototypes.
- Modelon's library developers captured Rimac's requirements and rapidly extended the library to suit their needs.
- Rimac can now make quick iterations of different system configurations and adapt their models to varying levels of abstraction.

CHALLENGE

Rimac is a Croatia-based technology powerhouse that manufactures electric hypercars and provides full technology solutions to global automotive manufacturers. Rimac specializes in high-voltage battery technology, electric powertrains, development of digital interfaces, and ADAS systems. To keep up with growing demand, Rimac needed a quicker and cost-effective way to perform powertrain component design loops without building physical prototypes. Rimac began their search for simulation tools that would allow them to make rapid model-based iterations and determine which components and configurations would be most suitable for each customer. Rimac's ideal solution would have the ability to model with reusable, scalable components for applications of differing levels of complexity. Additionally, Rimac's ideal solution needed to adapt easily to their existing toolset and current workflows.

SOLUTION

Rimac selected Modelon as their system modeling solution provider with the Modelon Electrification Library, Modelon Liquid Cooling Library, Modelon Hydraulics Library, Modelon Vehicle Dynamics Library, and Modelon training and services. **"Modelon's libraries contain many more components than competing libraries. These components are meaningfully different, and allow for modeling at different levels of abstraction, making them the best libraries we could find on the market"** said Kruno Hrvatinić, Head of Control and Simulation at Rimac Technology.

A driving factor in Rimac's decision to choose Modelon libraries was the benefit of Modelon libraries being built on the Modelica standard. Because this solution also supports FMI, an open standard for sharing and deploying models across different simulation tools, Rimac is able to facilitate the reuse of models and take advantage of domain-specific tools without losing the ability to collaborate on a single model. Additionally, Modelon's libraries give Rimac the freedom to implement their own detailed component models along with the pre-built models that come with each library.

Modelon

“Modelon’s libraries are giving us more confidence in our early system designs and enable us to build and run simulations more quickly than ever before. Where we used to apply manual steady-state analysis, we can now run a full simulation and get much more insight, opening new possibilities for Rimac.”

Kruno Hrvatinić
Head of Control and Simulation at Rimac Technology

Once Rimac started using the Modelon Electrification Library for battery pack and powertrain modeling, they identified several workflows to support their product development processes. These workflows required modification of key system design parameters, modular reconfiguration of the battery pack and battery level of detail, and additional interfaces for multi-physics simulation. Modelon and Rimac developed a partnership in which Modelon’s library developers captured Rimac’s requirements and rapidly extended the library to suit their needs. Today, not only does the Modelon Electrification Library satisfy Rimac’s specified requirements, but Modelon and Rimac will continue their partnership to include tested and validated battery pack and powertrain models by Rimac in an upcoming release of the Modelon Electrification Library.

RESULTS

With Modelon’s Electrification Library, Rimac now has a way to evaluate battery performance as part of a full multi-physics vehicle system simulation with drive cycle inputs. Because each component is reusable and scalable, Rimac can make quick iterations of their models and easily adjust the fidelity of the model depending on the phase of the project. Additionally, they can now connect the powertrain components to their cooling systems for thermal management simulations – something that previously required multiple software tools and additional effort.

As for future applications, Rimac plans to make use of the support for integrating their existing driveline component models (like gearbox dynamics), to achieve complete and portable multi-physics electric drive models. Additionally, Rimac will start to leverage other capabilities of the library, including aging models and more detailed controller and electrical system integration, to improve battery pack life and durability.